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SPECIFICATION

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Title of the Invention: SYSTEM AND METHOD FOR CHARGING USING  
DATA CARRIER

## SYSTEM AND METHOD FOR CHARGING USING DATA CARRIER

### Background of the Invention

### Field of the Invention

5           The present invention relates to a system and method for automatically calculating the charge for a plurality of dishes selected by customers in cafeterias, restaurants etc. using a data carrier.

### 10   Description of the Related Art

          In self-service cafeterias such as in-company cafeterias, etc. customers are often charged collectively by a customer carrying selected dishes and drinks on a tray along a predetermined course. As  
15   a conventional system for efficiently charging in cafeterias like these, an information processing system for cafeterias (Japanese Laid-open Patent Publication Nos. 60-124779 and 60-124780) is publicly known.

20           In this information processing system for cafeterias, the shape of a tray and tableware are recognized by photographing dishes and drinks placed on a tray and processing acquired images. The kind of dishes and drinks is judged and charged according to  
25   the size of tray, size of tableware, marks attached

to the bottom of tableware, etc.

However, since when charging is made according to the size of tableware, all dishes and drinks placed in the same tableware are charged the same, and one  
5 piece of tableware cannot be used for dishes or drinks of different prices. Even if different marks on the bottom of tableware are used for a plurality of dishes, prices cannot be flexibly set depending on the volume of a dish or drink. Furthermore, if two or more  
10 pieces of tableware are placed overlapping on a tray, the shape of the tableware cannot be accurately recognized.

#### **Summary of the Invention**

15 It is an object of the present invention to provide a charging system and method for flexibly setting the prices of many kinds of dishes and drinks provided in a cafeteria, etc. and easily calculating the charge for the dishes and drinks selected by a  
20 customer.

The charging system of the present invention comprises a writing unit, a reading unit and a calculating unit, and automatically calculates the charge for the dishes and drinks selected by a  
25 customer.

The writing unit writes data in a data carrier attached to tableware, the reading unit reads data from the data carriers of one or more dishes and drinks selected by a customer in a non-contact state.

5 The calculating unit calculates and displays the charge for the above-mentioned one or more dishes using the read data.

For a data carrier, for example, a device for storing data using an electronic element and communicating data with a reader/writer in a non-

10 contact state is used. This data carrier is attached to the bottom of a container (an item of tableware), etc.

The writing unit, for example, including a

15 reader/writer, writes data on the kind, price, etc. of dishes and drinks in the data carrier in a non-contact state. A customer selects favorite dishes and drinks, places the dishes and drinks in their containers on a tray, and carries the tray to the

20 reading unit. The reading unit, for example, including a reader/writer, reads data in a non-contact state from the data carrier of each of containers presented.

The calculating unit calculates and displays the total price of all selected dishes and drinks using

25 the read data such as kind, price, etc. The customer

can pay for the displayed charge in an arbitrary method such as in cash, with a pre-paid card, etc.

#### Brief Description of the drawings

- 5            Fig.1 explains the principle of the charging system of the present invention;
- Fig.2 shows mounting positions of data carriers;
- Fig.3 shows the configuration of a charging system;
- 10           Fig.4 shows an operating flow in a charging system;
- Fig.5 shows the configuration of a data carrier;
- Fig.6 is a flowchart showing the operation of a reader/writer;
- 15           Fig.7 is a flowchart showing the operation of a data carrier;
- Fig.8 shows the protocol procedure of a read/write operation;
- Fig.9 shows the configuration of a first data
- 20           carrier writing device;
- Fig.10 shows the appearance of a first data carrier writing device;
- Fig.11 is a flowchart showing the operation of a first data carrier writing device;
- 25           Fig.12 shows the configuration of a second data

carrier writing device;

Fig.13 shows the appearance of a second data carrier writing device;

Fig.14 is a flowchart showing the operation of  
5 a second data carrier writing device;

Fig.15 shows the configuration of an automatic charging apparatus;

Fig.16 shows the appearance of an automatic charging apparatus;

10 Fig.17 is a flowchart showing the operation of an automatic charging apparatus;

Fig.18 shows an information processing device; and

Fig.19 shows recording media.

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#### **Description of the Preferred Embodiment**

The detailed preferred embodiments of the present invention are described below with reference to the drawings.

20 Fig.1 explains the principle of the charging system of the present invention. The charging system shown in Fig.1 comprises a writing unit 1, a reading unit 2 and a calculating unit 3, and automatically calculates the charge for the dishes and drinks  
25 selected by a customer.

The writing unit 1 writes data in a data carrier 5 attached to a container of a dish or drink, and the reading unit 2 reads data in a non-contact state from the data carrier 5 of one or more dishes and drinks selected by a customer. The calculating unit 3 calculates and displays the charge for the above-mentioned one or more dishes and drinks using the read data.

For the data carrier 5, for example, a device for storing data using an electronic element and communicating data in a non-contact state with a reader/writer is used. This data carrier 5 is attached to the bottom of a container (tableware) 4, etc.

The writing unit 1, for example, including a reader/writer, writes data on the kind, price, etc. of dishes and drinks in the data carrier 5. A customer selects favorite dishes and drinks, places the dishes and drinks in their containers 4 together on a tray, and carries the dishes and drinks to the reading unit 2. The reading unit 2, for example, also including a reader/writer, reads data in a non-contact state from the data carriers 5 of each of the presented containers 4.

The calculating unit 3 calculates and displays the total price of all selected dishes and drinks

using the read data such as kind, price, etc. The customer can pay for the displayed charge in an arbitrary method such as in cash, with a pre-paid card, etc.

5           In this way, by storing data such as price, etc. for each dish or drink using a data carrier which data are written in and read from in a non-contact state, a plurality of dishes and drinks can be collectively charged.

10           If a re-writable data carrier is used, data can be changed every time the combination of dishes/drinks and containers is changed, and thereby dishes and drinks with different prices can be served in one kind of container. Depending on the volume of a dish or  
15           drink, data can also be changed. Furthermore, since there is no need to recognize the shape of a container, if containers are placed overlapping on a tray, the total charge can still be accurately calculated.

20           For example, the writing unit 1 shown in Fig.1 corresponds to the data carrier writing device 14 shown in Fig.3, described later, and both reading unit 2 and calculating unit 3 correspond to the automatic charging apparatus 15 shown in Fig.3.

25           In this embodiment a data carrier for storing



data such as price, etc. is attached to the bottom of tableware containing dishes and drinks, and by collectively reading the data of a plurality of items of tableware placed on a tray, the total charge is automatically calculated.

For such a data carrier, for example, a device for storing data using an electronic element and communicating data in a non-contact state with a reader/writer is used. An electro-magnetic coupling method, an optical communication method, a microwave method and an electro-magnetic induction method are the methods of communication between the data carrier and the reader/writer, and which are used depending on the system design. There are a read-only type, and a read and write type as the forms of access. In this embodiment, in order to make the re-writing of data possible, a read and write type is assumed to be used.

Fig.2 shows examples of the mounting positions of data carriers. In Fig.2, data carriers 12 are embedded in the bottom of items of tableware 11 of a dish, such as a plate, a bowl, etc., and these items of tableware 11 are carried on a tray 13. Both tableware 11 and tray 13 are made of a non-metallic material (for example, plastics) so as not to have an influence on the detection by the data carrier 11. The

same applies to a cup, glass, etc. for drinks.

Even if the data carrier 12 is directional in data communication, by embedding the data carriers 12 in the bottom of tableware 11 and arranging the tableware 11 flatly on one plane, the directions of the data carriers 12 can be accurately orientated. In Fig.2, the reader/writer detects the data carrier 12 from either the upward or downward direction of the tray 13, and thereby communicates with the data carrier 12.

Fig.3 shows the configuration of the charging system of this embodiment. The system shown in Fig.3 comprises a data carrier writing device 14 for writing data such as price, etc. in the data carrier 12 embedded in each item of tableware 11, and an automatic charging apparatus 15 for calculating the charge for the dishes and drinks placed on a tray 13. Fig.4 shows an operating flow in this charging system.

First, after an employee cleans tableware 11 (P1), the flow proceeds according to one of cases A, B and C. Case A is applied to tableware 11 which is repeatedly used for a plurality of different dishes and drinks, and Case B is applied to tableware the use of which is fixed. Case C is applied to a case where a customer decides on the volume of selected dishes

or drinks.

In case A, the employee writes data in the data carrier 12 of an item of tableware 11 using the data carrier writing device 14 (P2), and serves dishes and  
5 drinks corresponding to the data into the item of tableware 11 (P3). In this case, the kind and price of a dish or drink are written in the data carrier 12.

Then, a customer selects the tableware 11 containing his/her favorite dishes and drinks, and  
10 places the tableware 11 on a tray 13 (P6). Step P6 is repeated according to the number of selected dishes and drinks. Then, the customer carries the tableware 11 to the automatic charging apparatus 15, and pays for the selected dishes and drinks (P7). When the  
15 customer has dined (P8) and returned the tableware 11 (P9), steps P1 and after are repeated again.

In case B, since data corresponding to dishes and drinks are already written in the data carrier 12 and there is no need to change the data, the employee  
20 serves a predetermined dish into the tableware 11 (P3). In this case too, the kind and price of a dish or drink is written in the data carrier 12. In the same way as in case A, the customer carries out steps P6 and after.

25 In case C, the customer serves a desired volume

of a favorite dish or drink into the tableware 11 (P4). Then, the customer measures the weight of the dish or drink using the data carrier writing device 14, which writes data such as price, etc. according to the weight of the dish or drink in the data carrier 12 (P5). In this case, the kind, unit price (price per unit weight), weight and price calculated by multiplying the unit price by the weight of the dish or drink are written in the data carrier 12. Then, in the same way as in case A, the customer carries out steps P6 and after, and repeats steps P4, P5 and P6 as necessary.

In this way, in case A, the data of the data carrier 12 is re-written every time depending on the kind and price of a dish or drink to be served in tableware 11, and in case B, the data of the data carrier 12 is not re-written, as long as a menu is not changed. In case C, data is written in the data carrier 12 according to the kind, unit price and weight of a served dish or drink.

Next, the communication method between a plurality of data carriers and a reader/writer is described below with reference to Figs.5 to 8.

Fig.5 shows the configuration of a data carrier. The data carrier shown in Fig.5 comprises an antenna

coil 21 and an IC (integrated circuit) chip 22. The IC chip 22 comprises a voltage generator circuit 23, a modulator/demodulator circuit 24, a communication control logic 25 and a memory unit 26. A  
5 reader/writer, not shown in the drawing, comprises an antenna for communicating with the data carrier, and a transmitter-receiver unit for communicating with a computer.

The reader/writer, for example, generates a local  
10 electro-magnetic field using a weak electric signal, and thereby calls up the data carrier. When a data carrier is held over the induced electro-magnetic field, electromotive force is generated in the antenna coil 21 being a conductor, and the voltage generator  
15 circuit 23 generates the power source voltage of the data carrier from this electromotive force.

At this time, the antenna coil 21 transmits and receives data by communication with the antenna of the reader/writer. The modulator/demodulator circuit 24  
20 modulates transmission data, and demodulates received data. The communication control logic 25 reads the transmission data from the memory unit 26, and stores the received data in the memory unit 26. Thus, data is read from the memory unit 26 of the data carrier  
25 to the reader/writer, and is written from the

reader/writer to the memory unit 26.

Fig.6 is a flowchart showing the operation of a reader/writer. First, the reader/writer generates an electro-magnetic field, makes an inquiry for (calls up) data carriers (step S1), and judges whether or not there is an answer (step S2). If there is an answer from any data carrier, the reader/writer communicates with the data carrier, reads or writes data (step S3), and repeats steps S1 and after.

10        If there are answers from a plurality of data carriers in step S2, the reader/writer reads or writes the data of the data carrier which answered first. If there is no answer from a data carrier, the reader/writer repeats steps S1 and after.

15        Fig.7 is a flowchart showing the operation of a data carrier. First, when the data carrier detects an electro-magnetic field generated by a reader/writer and receives an inquiry (step S11), under the control of the communication control logic 25, the data carrier answers the inquiry (step S13) after delaying for a certain period which is set at random (step S12).

20        Then, the data carrier judges whether or not there is a communication request from the reader/writer (step S14). If there is a communication

25

request, the data carrier communicates with the reader/writer, and stores received data in the memory unit 26 or transmits data read from the memory unit 26 (step S15).

5           Under the control of the communication control logic 25, the data carrier enters a state where it does not answer an inquiry from the reader/writer for a certain period (step S16), and terminates the operation. If there is no communication request from  
10 the reader/writer in step S14, the data carrier repeats steps S11 and after.

Fig.8 shows the protocol procedure in the case where the reader/writer mounted on the automatic charging apparatus 15 shown in Fig.15 communicates  
15 with data carriers D1, D2 and D3 embedded in each of three items of tableware on a tray. In Fig.8, first, when the reader/writer transmits an inquiry for data carriers (T1), the data carriers D1, D2 and D3 which receive the inquiry, delay in answering for random  
20 periods, and then transmit answers to the reader/writer (T2). Out of the data carriers D1, D2 and D3, the data carrier D2 which answers first communicates with the reader/writer, and its data is read (T3).

25           Then, when the reader/writer transmits an inquiry

for data carriers again (T4), out of the data carriers D1, D2 and D3 which receive the inquiry, only D1 and D3 delay in answering for random periods, and then transmit answers to the reader/writer (T5). At this  
5 time, the data carrier D2 which has already communicated with the reader/writer does not transmit an answer. Then, the data carrier D1 which answered first, communicates with the reader/writer, and its data is read (T6).

10 Then, when the reader/writer transmits an inquiry for data carriers again (T6), out of the data carriers D1, D2 and D3 which receive the inquiry, only D3 delays in answering for a random period, and then transmits an answer to the reader/writer (T8). At this  
15 time, the data carriers D1 and D2 which have already communicated with the reader/writer do not transmit answers. Then, the data carrier D3 communicates with the reader/writer, and its data is read (T9).

In this way, by the reader/writer communicating  
20 with the data carriers one by one, data are read from a plurality of data carriers in order, and are input to the automatic charging apparatus 15.

Next, the detailed configuration and operation  
of both data carrier writing device 14 and automatic  
25 charging apparatus 15 shown in Fig.3 are described



below with reference to Figs.9 to 19.

Fig.9 shows the configuration of the data carrier writing device in which weight is not measured. Fig.10 shows the appearance of the data carrier writing device. This data carrier writing device comprises a weight sensor 31, a writing unit 32, an operating unit 33, a control unit 34 and a display unit 35. The display unit 35 further comprises a display 41; a light emitting diode (LED) 42 which indicates while writing, and an LED 43 for indicating that the result of writing is acceptable. The operating unit 33 further comprises a write button 44 and a cancel button 45, and the writing unit 32 corresponds to the reader/writer in the above-mentioned case.

Fig.11 is a flowchart showing the operation of the data carrier writing device shown in Fig.9. First, the employee inputs data such as the kind, unit price, weight, price, etc. of a dish or drink to the operating unit 33 (step S21), places tableware 11 containing the corresponding dish or drink on the top of the data carrier writing device shown in Fig.10 (step S22). The control unit 34 judges whether tableware 11 is detected based on a signal from the weight sensor 31 (step S23). When the weight sensor 31 detects the weight of the tableware 11 and reports

the weight to the control unit 34, the control unit 34 judges that tableware 11 has been detected, and then judges whether or not data are instructed to be written based on a signal from the operating unit 33 (step S24).

When the employee presses the write button 44 on the operating unit 33, the operating unit 33 reports the instruction to the control unit 34, and the control unit 34 instructs the writing unit 32 to write data (step S25). Then, the writing unit 32 writes the data input in step S21 in the data carrier 12, and the control unit 34 lights the LED 42.

Then, the writing unit 32 checks the written data (step S26). In this case, data are checked, for example, by repeating a predetermined number of data readings. If the read data are not correct, the writing unit 32 re-writes the data again (step S25).

If the read data are correct, the control unit 34 displays the written data contents on the display 41 (step S27). To indicate that the writing is carried out correctly the control unit 34 extinguishes the LED 42 and lights the LED 43, and terminates the operation.

The employee can also cancel the writing operation by pressing the cancel button 45 while the

LED 42 is lit, and try again from the data inputting step. The data carrier writing device such as this is mainly used in the above cases A and B.

Next, Fig.12 shows the configuration of the data carrier writing device in which weight is measured. Fig.13 shows the appearance of the data carrier writing device. This data carrier writing device comprises a weight measuring unit 51, a writing unit 53, an operating unit 54, a control unit 55 and a display unit 56. The weight measuring unit 51 further comprises a weight sensor 52, and the display unit 56 further comprises a display 61, an LED 62 which indicates while writing, and an LED 63 for indicating that the result of writing is acceptable. The writing unit 53 corresponds to the reader/writer in the above-mentioned case.

Fig.14 is a flowchart showing the operation of the data carrier writing device shown in Fig.12. The employee inputs in advance data such as the kind, unit price, etc. of a dish or drink to the operating unit 54 (step S31), and the customer places tableware 11 with a dish or drink on the top of the data carrier writing device (step S32).

The weight measuring unit 51 measures the weight of the tableware 11 and reports the result of

measurement to the control unit 55. The weight sensor 52 detects whether or not tableware is placed thereon, and reports the result of this detection to the control unit 55 (step S33).

5       The control unit 55 judges whether or not tableware 11 is detected based on a signal from the weight sensor 52 (step S34). If tableware 11 is detected, then the control unit 55 judges whether or not data are instructed to be written based on a  
10       signal from the operating unit 54 (step S35).

      When the customer instructs to write from the operating unit 54, the control unit 55 instructs the writing unit 53 to write (step S36). Then, the writing unit 53 writes data in the data carrier 12, and the  
15       control unit 55 lights the LED 62. In this case, besides the data input in step S31, the measured weight, price, etc. of a dish or drink are written.

      The weight data to be written may or may not include the weight of the tableware 11 itself. For  
20       example, by subtracting the weight of the tableware 11 itself measured in advance from the total measured weight, the weight of only a dish or drink can be calculated. By multiplying a unit price by the weight of a dish or drink, the price of a served dish can  
25       also calculated.

Then, in the same way as in step S26 shown in Fig.11, the writing unit 53 checks the written data (step S37), and if the data are not correct, the writing unit 53 re-writes the data again (step S36).

5        If the read data are correct, the control unit 55 displays the written contents on the display 61 (step S38). In this case, to indicate that writing is carried out correctly, the control unit 55 extinguishes the LED 62 and lights the LED 63, and  
10       terminates the operation. Although a data carrier writing device such as this is mainly used in case C shown in Fig.4, this device can also used in cases A and B.

Next, Fig.15 shows the configuration of an  
15       automatic charging apparatus. This automatic charging apparatus comprises a weight sensor 71, a reading unit 72, an operating unit 73, a control unit 74, a display unit 75, a charge calculating unit 76, a storing unit 77 and a charge settling unit 78. Out of these units  
20       the reading unit 72 corresponds to the reader/writer in the above-mentioned system.

Although the appearance of the automatic charging apparatus is shown in Fig.3, the automatic charging apparatus can also be configured as shown in Fig.16.  
25       The automatic charging apparatus shown in Fig.16

comprises a reading device 81 and a calculating device 82. For example, the reading device 81 comprises the weight sensor 71 and the reading unit 72 shown in Fig.15, and the calculating device 82 comprises the  
5 operating unit 73, control unit 74, display unit 75, charge calculating unit 76, storing unit 77 and charge settling unit 78.

Fig.17 is a flowchart showing the operation of the automatic charging apparatus. First, the customer  
10 places a tray 13 with tableware 11 on the reading device 81 (step S41).

The control unit 74 judges whether or not the tray 13 is detected based on a signal from the weight sensor 71 (step S42). When the weight sensor 71  
15 detects the weight of the tray 13 and reports the weight to the control unit 74, the control unit 74 judges that the tray 13 is detected, and then judges whether or not data reading is instructed based on a signal from the operating unit 73 (step S43).

20 When the customer instructs to read via the operating unit 73, the control unit 74 instructs the reading unit 72 to read data (step S44). Then, the reading unit 72 reads data from the data carriers 12 of all the tableware 11 on the tray 13 as described  
25 above, and sends the read data to the charge

calculating unit 76 via the control unit 74.

The charge calculating unit 76 calculates the total amount by adding up all received price data (step S45), and displays the total amount on the display of the display unit 75 (step S46). The charge settling unit 78 settles the total amount received from the charge calculating unit 76 in a method designated by the customer, and prints out the amount on a detailed statement (receipt) including the kind and price of each dish, total amount, etc. (step S47). The customer pays for the charge, for example, in cash, with a prepaid card, with an ID card or with a credit card.

When the charge calculating unit 76 receives from the charge settling unit 78 a report that the charge is settled, the charge calculating unit 76 stores the charge settlement history information in the storing unit 77, and terminates the operation. Thus, the amount charged for dishes and drinks selected by the customer is automatically settled.

Although in this embodiment it is assumed that the kind, unit price, weight and price are all written in the data carrier, a part of this data can also be stored in the storing unit 77 of the automatic charging apparatus in advance, to be referred to when

calculating.

For example, in cases A and B shown in Fig.4, only the kind of dishes and drinks is written in the data carrier, and a correspondence table between the kind and price of dishes and drinks is stored in the automatic charging apparatus in advance. In this case, in step S45 shown in Fig.17, the charge calculating unit 76 reads the price data from the storing unit 77 corresponding to the read data on the kind of a dish or drink, and calculates total amount using these data.

However, if only the price of dishes and drinks is written in the data carrier in advance, information on the kind of a dish or drink cannot be obtained. Therefore, if at least the kind and price are written in advance, the charge can be calculated without referring to the table, and the kind of a dish or drink can be output.

In case C shown in Fig.4, only the kind and weight of dishes and drinks are written in the data carrier in advance, and a correspondence table between the kind and price of dishes and drinks is stored in the automatic charging apparatus. In this case, in step S45 shown in Fig.17, the charge calculating unit 76 reads the unit price data corresponding to the kind



of a dish or drink from the storing unit 77, and calculates the price of each dish or drink and the total amount using both the unit price data and weight data.

5           However, if only the price of dishes and drinks or only the weight and price are written in the data carrier in advance, information on the kind of a dish or drink cannot be obtained. Therefore, if at least the kind and price are written in the data carrier in  
10           advance, can the charge be calculated without referring to the table, and can the kind of a dish or drink be output. The calories of a dish or drink can also be calculated using data written in the data carrier. For example, the kind and weight of dishes  
15           and drinks are written in the data carrier, and a correspondence table between the kind and calories per unit weight is stored in the automatic charging apparatus in advance.

          The automatic charging apparatus reads the  
20           calories data per unit weight corresponding to the kind of a dish or drink, and calculates both the calories of each dish or drink and the total calories using both calorie data and weight data. The result of the calories calculation is displayed on the  
25           display and output on a detailed statement.

Further, the calories per unit weight can be handled in the same way as the above-mentioned unit price, and can be written in the data carrier in advance. In this case, since the calories of each dish or drink can be obtained by multiplying calories per unit weight by weight, the table is not needed.

The above-mentioned data carrier writing device or automatic charging apparatus comprises, for example, an information processing device (computer) as shown in Fig.18. The information processing device shown in Fig.18 comprises a CPU (central processing unit) 91, a memory unit 92, an input unit 93, an output unit 94, an external storage unit 95, a medium driver unit 96 and a network connecting unit 97, which are connected with each other by a bus 98.

The memory unit 92 stores programs for processing as well as data. The memory unit 92 comprises, for example, a ROM (read only memory), a RAM (random access memory), etc. The CPU 91 executes each of the above-mentioned processes of the charging system by running programs using the memory unit 92.

The input unit 93 corresponds to the above-mentioned operating unit 33, 54 or 73, and includes an operation button, a keyboard, a scanner, etc. This input unit 93 is used to input necessary

instructions and data. The output unit 94 corresponds to the above-mentioned display unit 35, 56 or 75, and outputs data such as price, weight, etc.

5 The external storage unit 95 uses, for example, a magnetic disk, an optical disk, a magneto-optical disk, etc. This external storage unit 95 stores the above-mentioned programs and data, which can also be used by being loaded to the memory unit 92, if necessary. The above-mentioned storing unit 77  
10 corresponds to the memory unit 92 or the external storage unit 95.

The medium driver unit 96 drives a portable recording medium 99, and accesses the recorded contents of the recording medium. The portable  
15 recording medium 99 uses an arbitrary computer-readable recording medium, such as a memory card, a floppy disk, a CD-ROM (compact disk read only memory), an optical disk, a magneto-optical disk, etc. This portable recording medium 99 stores in advance both  
20 the above-mentioned programs and data, which can be used by being loaded to the memory unit 92, if needed.

The network connecting unit 97 communicates with an external device via an arbitrary network of a LAN (local area network), etc. Thus, the above-mentioned  
25 programs and data can also be obtained from the

external device, and be used by being loaded to the memory unit 92.

Fig.19 shows the configuration of a computer readable recording medium which can provide the information processing device shown in Fig.18 with programs and data. The programs and data stored in the portable recording medium 99 or a database 100 can be loaded to the memory unit 92. The CPU 91 executes the necessary processes by running the programs using the data.

Although in the embodiment described above, a data carrier stores data using an electronic element, data can also be recorded using bar codes, etc. instead of the electronic element. In this case, data can be read using a bar code reader.

Although an embodiment in a cafeteria is described here, the present invention can be widely used when the charge for many kinds of goods selected by a customer is to be settled collectively. For example, if in a shop such as a supermarket, etc. a data carrier is attached to the surface of goods, and goods selected by the customer are arranged flatly on one plane using a tray, etc., the direction of all data carriers becomes the same. Therefore, even if a directional data carrier is used, data can be read

collectively, and the charge can be automatically calculated.

5 In this case, since data carriers are taken away together with goods by a customer, it is desirable the unit price of a data carrier to be sufficiently low. For this reason, the utility value of this type of automatic charging system will be increased when a cheap data carrier becomes available in the future.

10 In the present invention, by attaching a re-writable data carrier to tableware, prices can be flexibly set for many kinds of dishes and drinks provided in a cafeteria, etc. Furthermore, the charge and calories of dishes and drinks selected by the customer can be easily calculated.